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Purse

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[54] **STEEL JOIST AND CONCRETE FLOOR SYSTEM**

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[51] **Int. Cl.**[6] **E04B 5/40**

[52] **U.S. Cl.** **52/263**; 52/326; 52/333; 52/336; 52/338; 52/450; 52/252; 52/334

[58] **Field of Search** 52/319, 326, 333, 52/334, 336, 338, 339, 261, 263, 690, 692, 693, 694, 450, 250, 252

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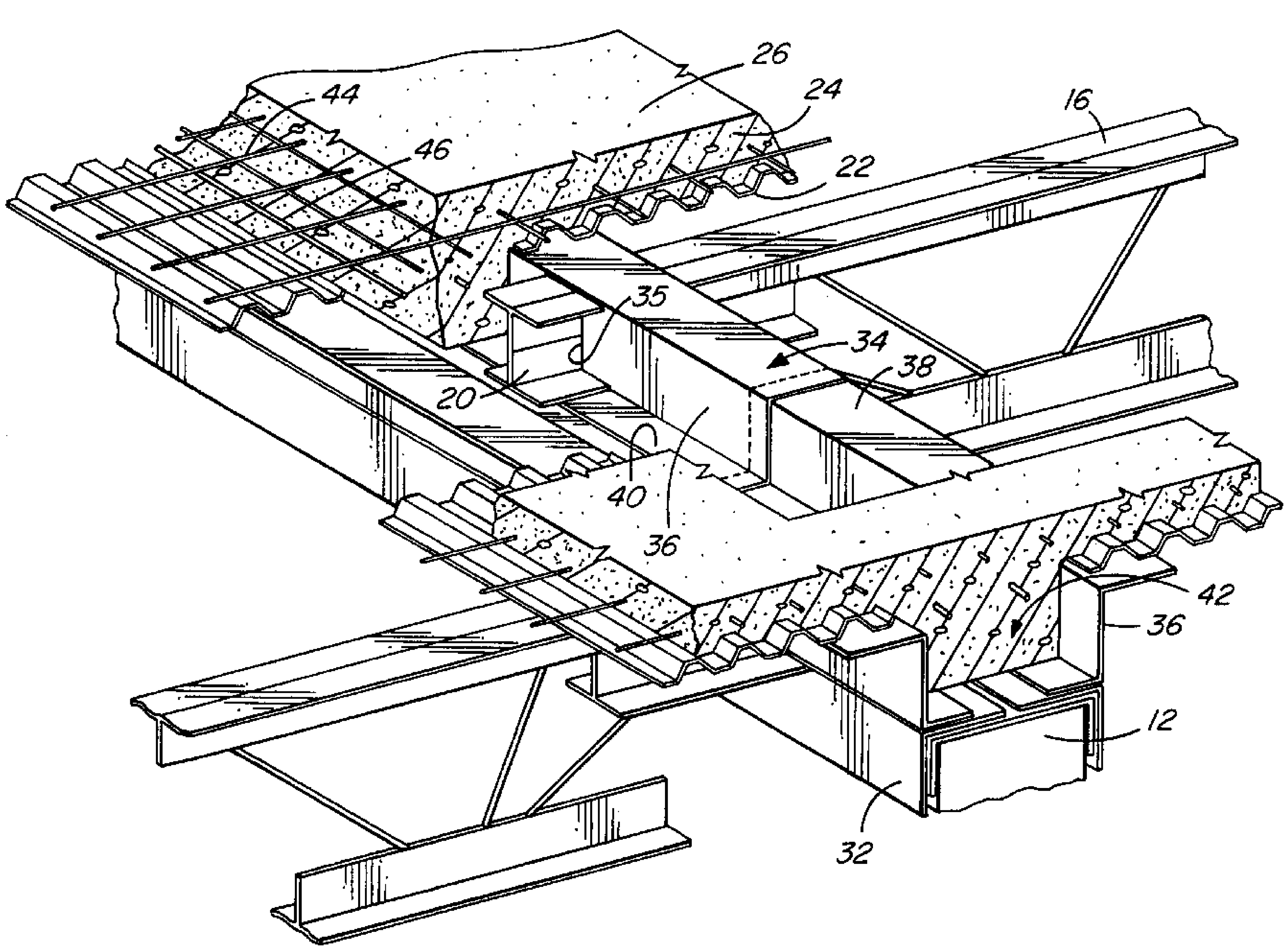
[57] **ABSTRACT**

A concrete floor system includes the use of sheet metal pan or decking and sheet metal z-shaped closures sitting upon low profile open web steel joist providing a non-structural or structural concrete brake above the walls forming vibration damping and sound & fire barriers. The z-shaped closures have apertures formed through them which correspond to the end profiles of the joist shoes of the joists, and are fitted onto the joists before or after the joists are in place. The need for sound and vibration damping rock wool, foams and other similar material below the floor and between walls is eliminated.

17 Claims, 9 Drawing Sheets



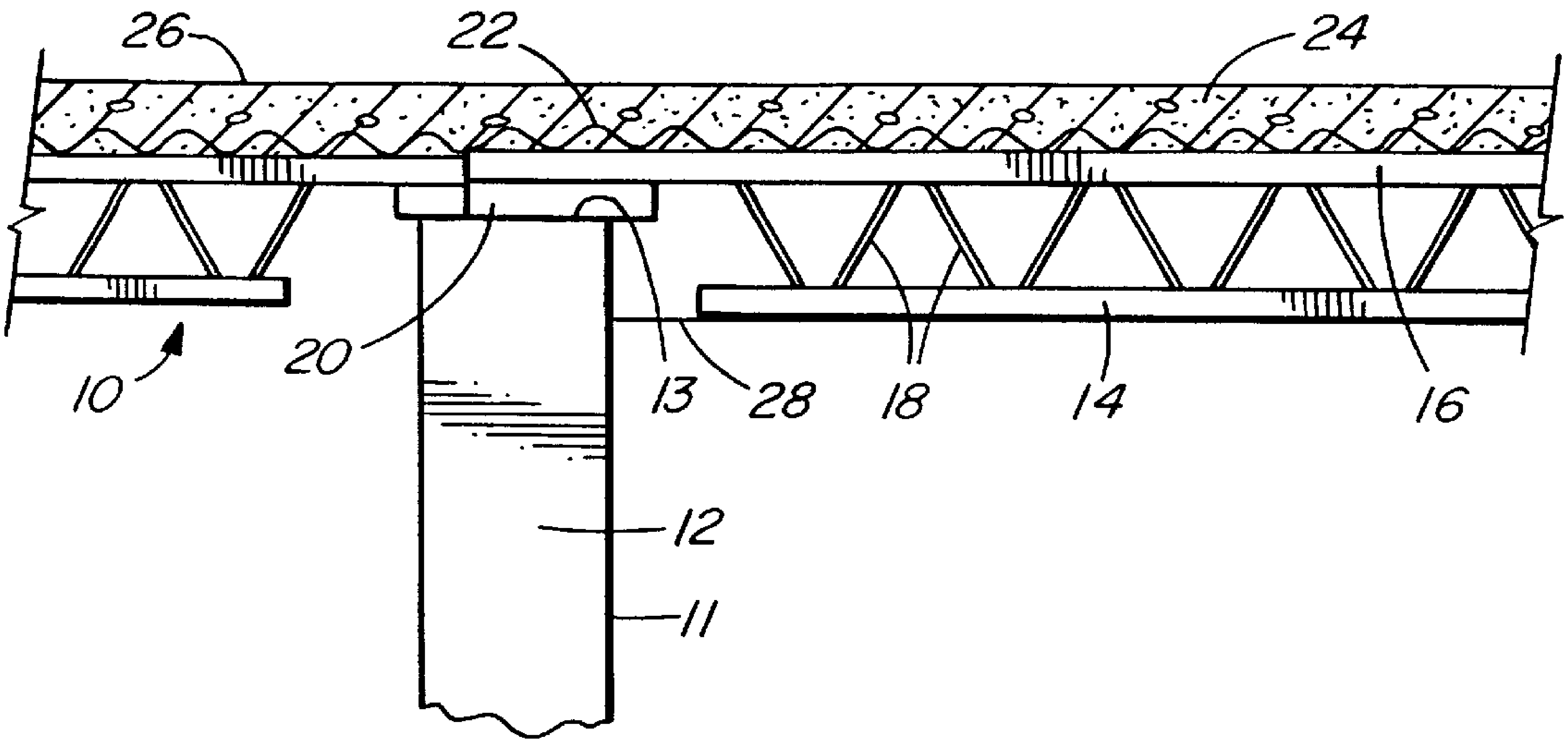


FIG. 1 (PRIOR ART)

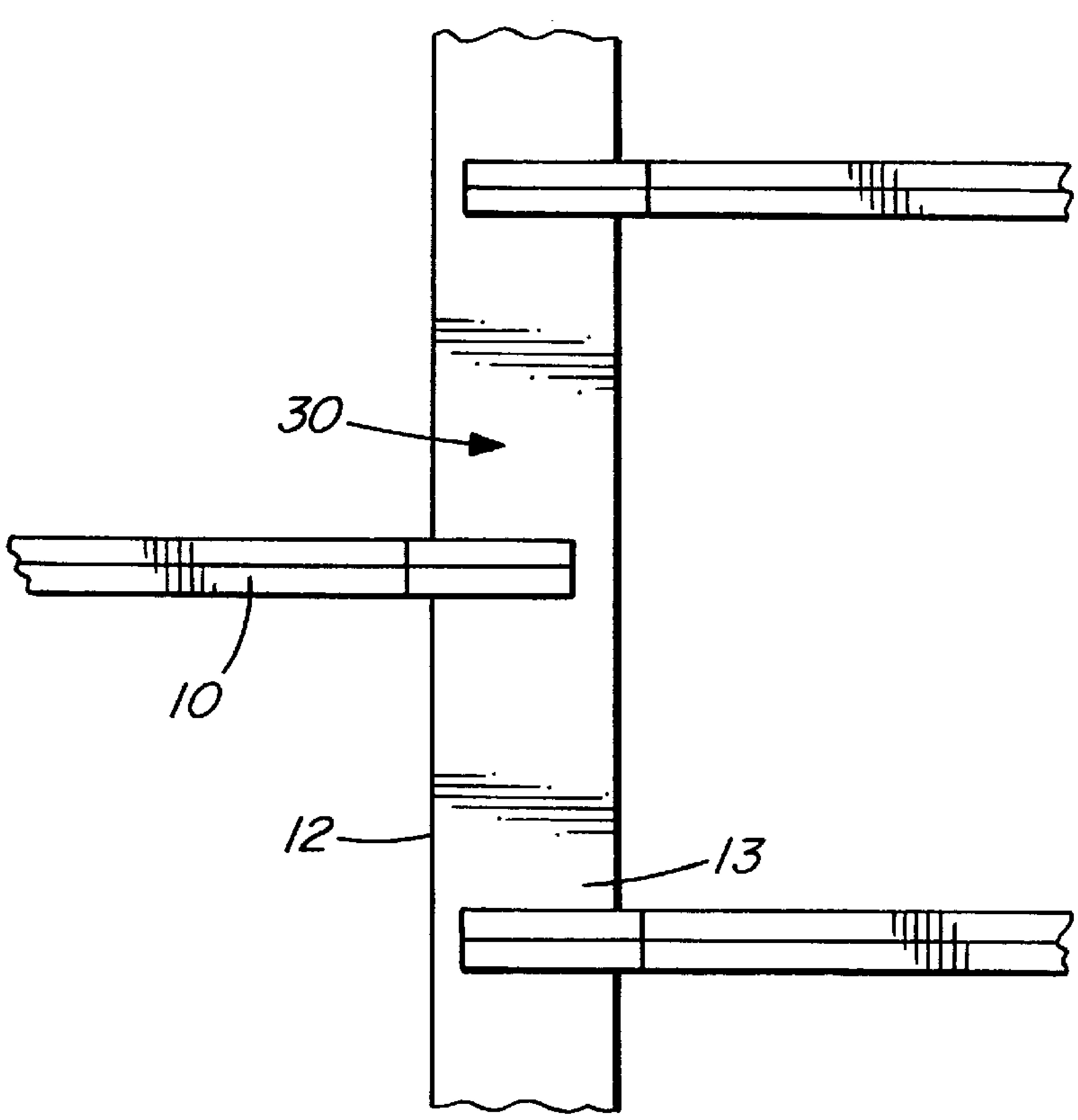


FIG. 2 (PRIOR ART)

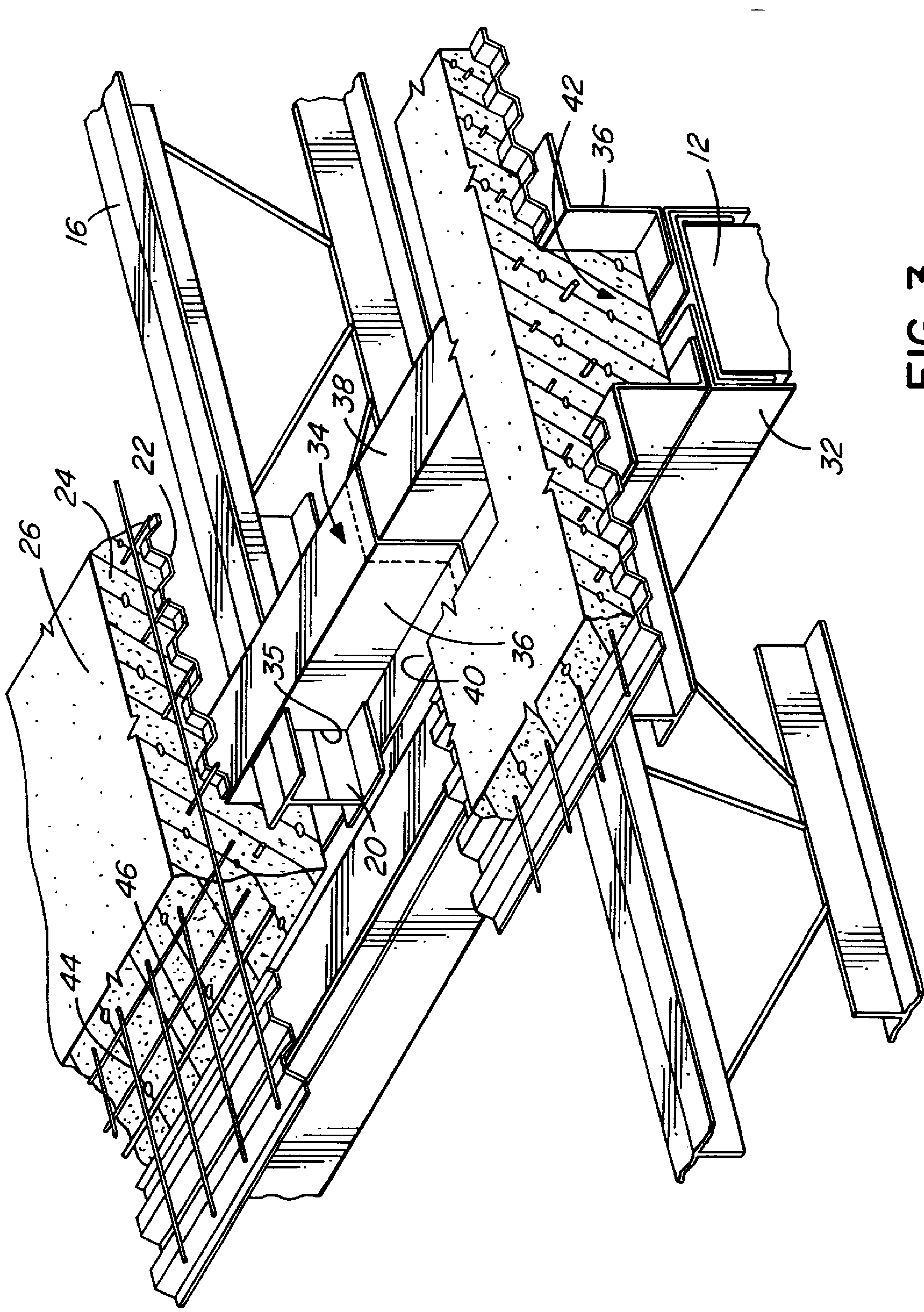


FIG. 3

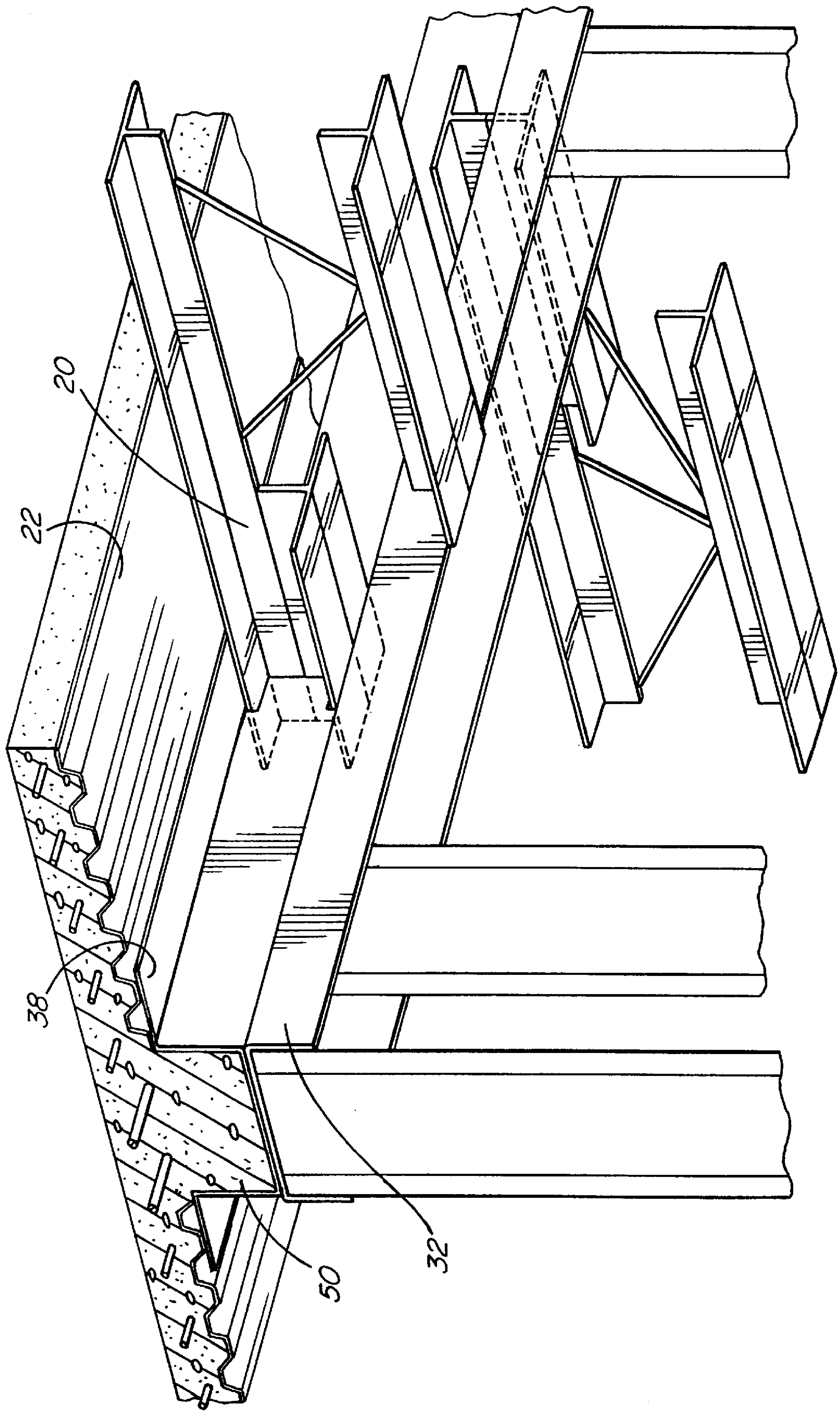


FIG. 4

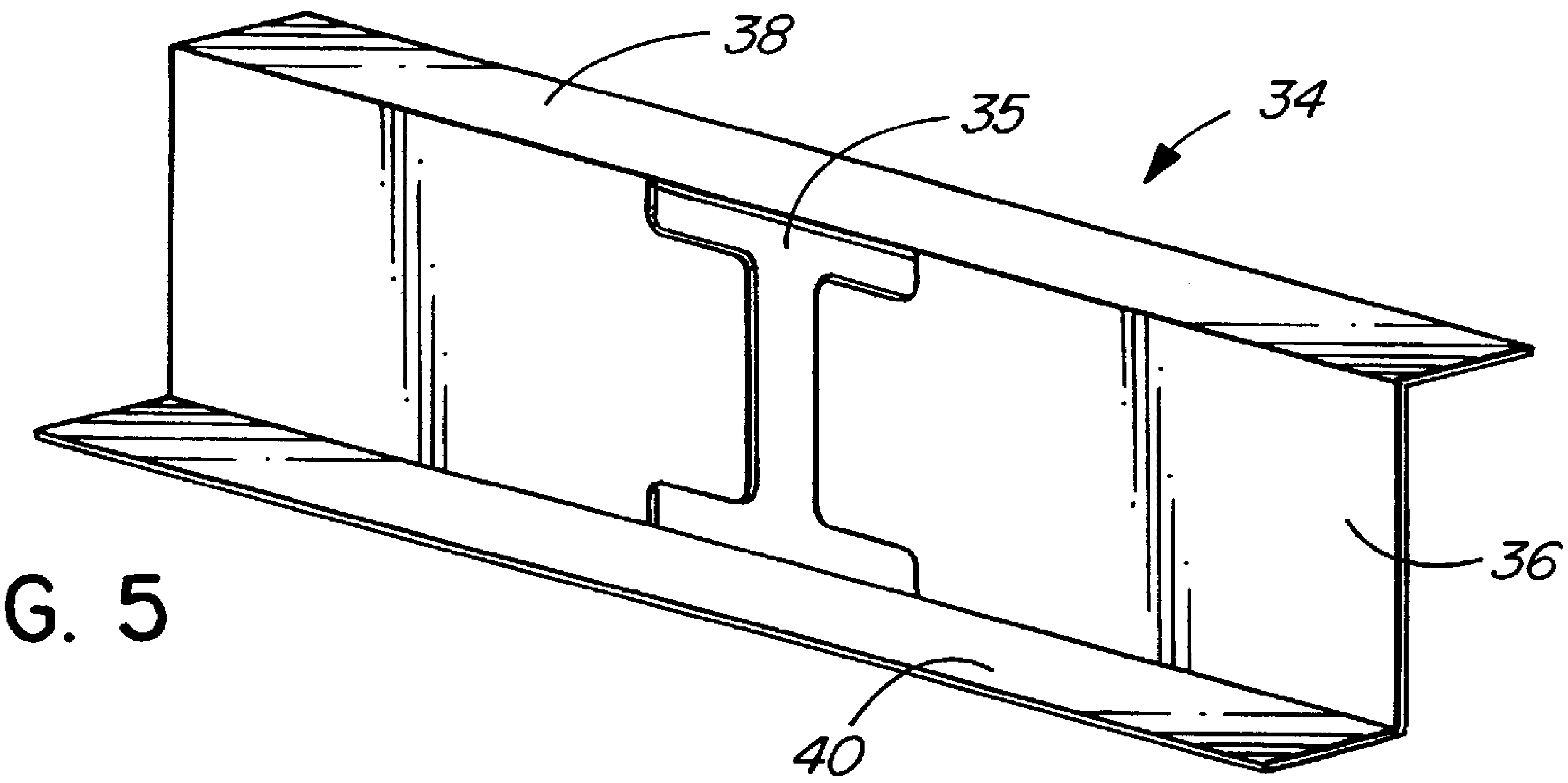


FIG. 5

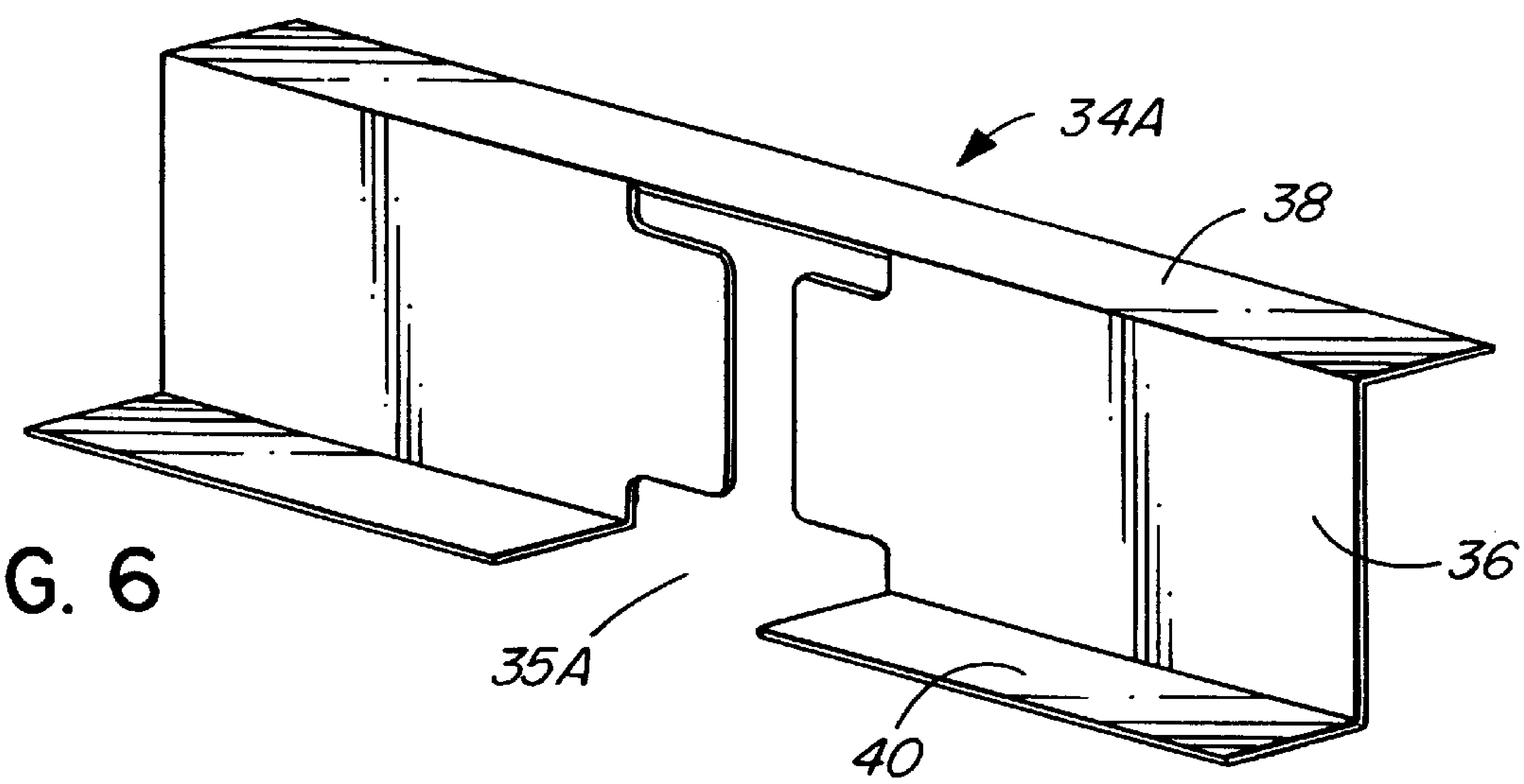


FIG. 6

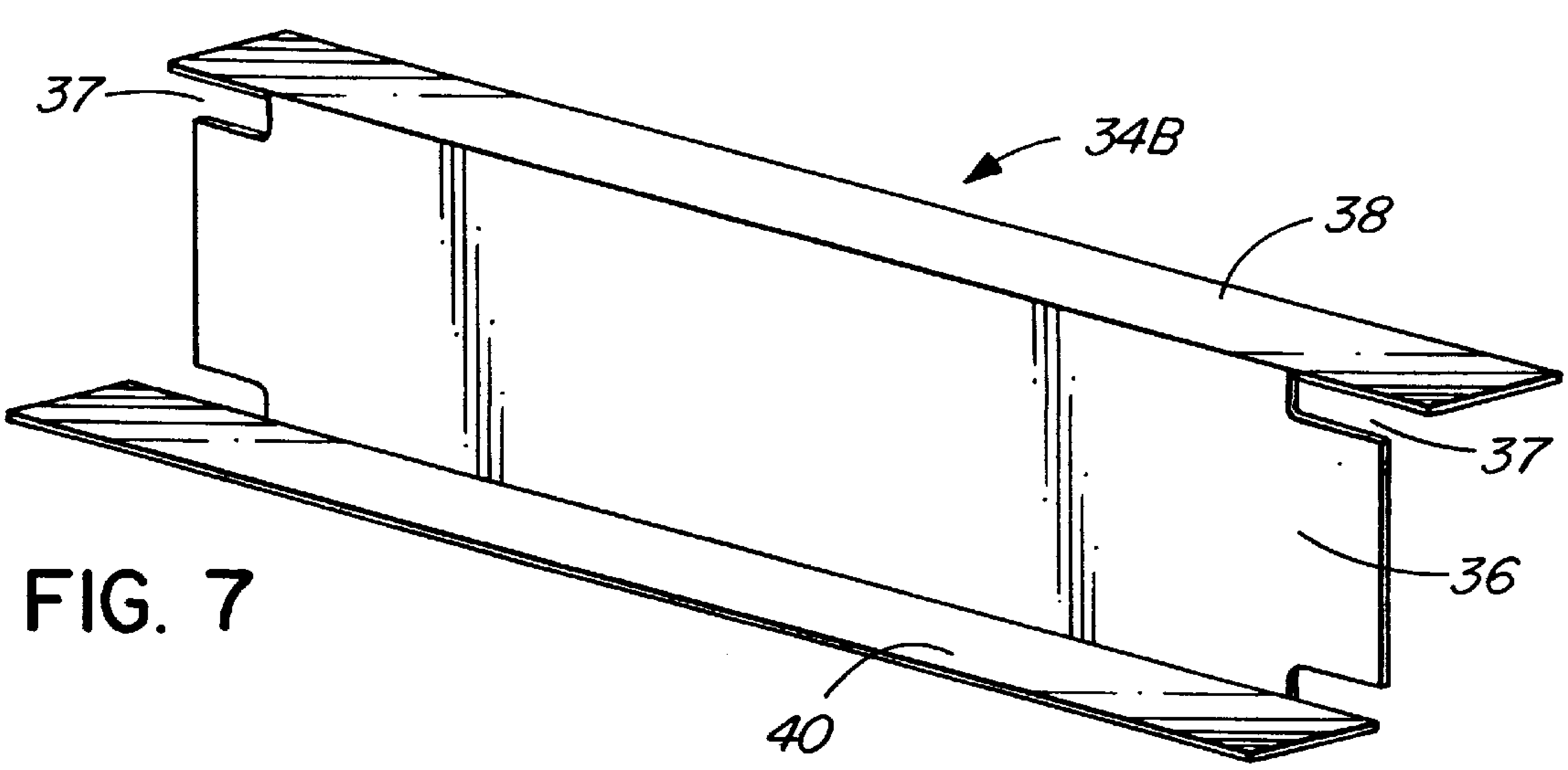


FIG. 7

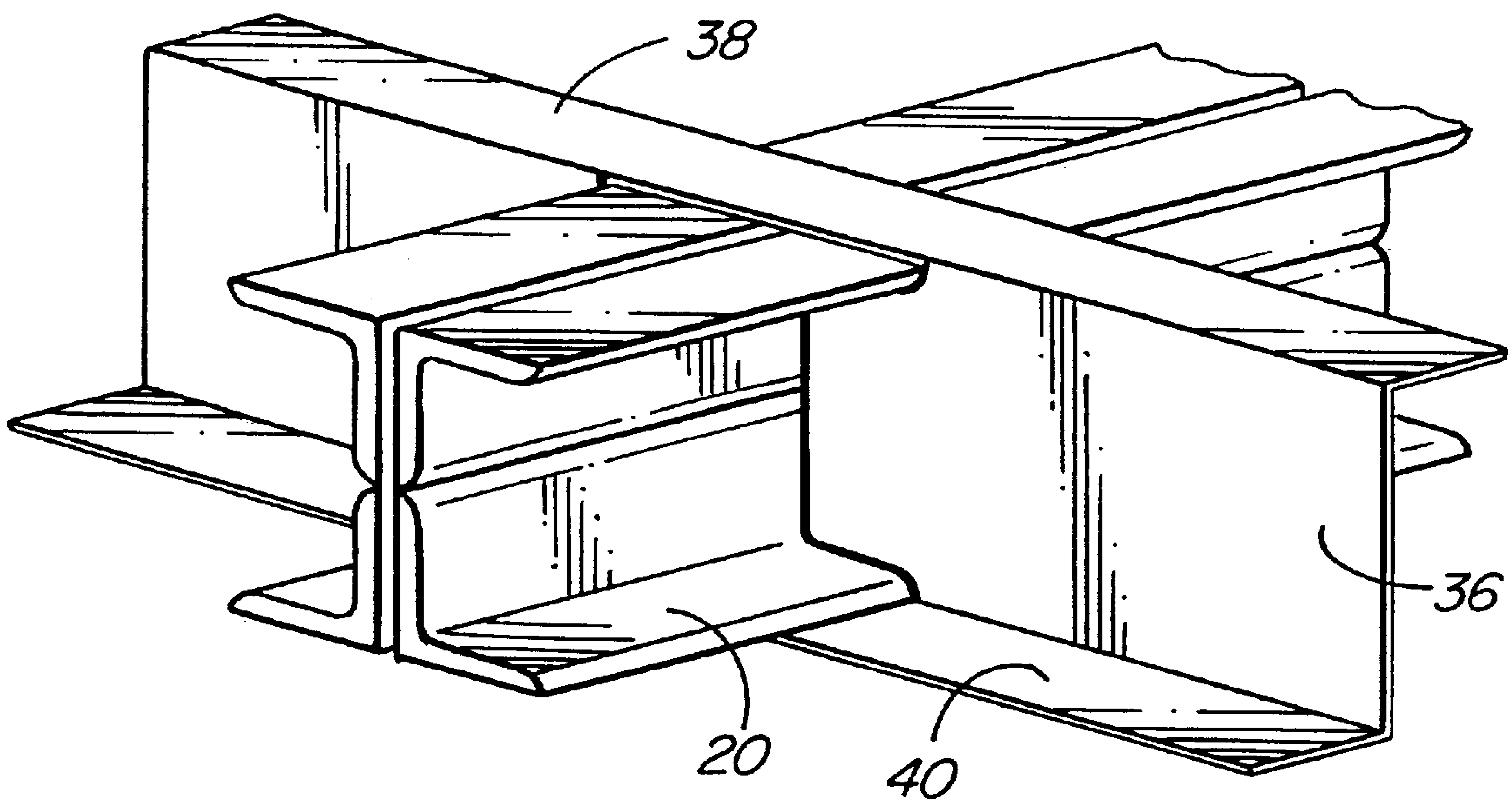


FIG. 8

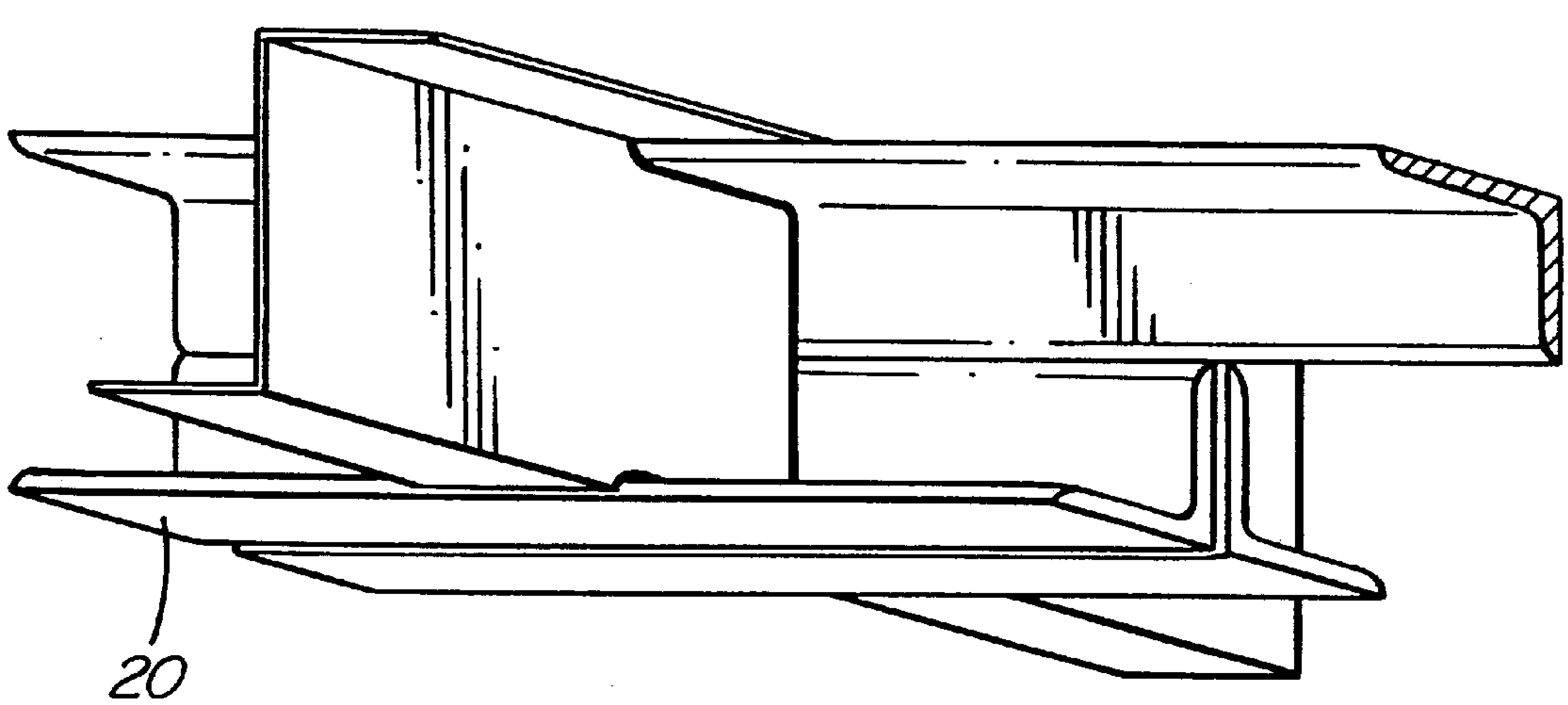


FIG. 9

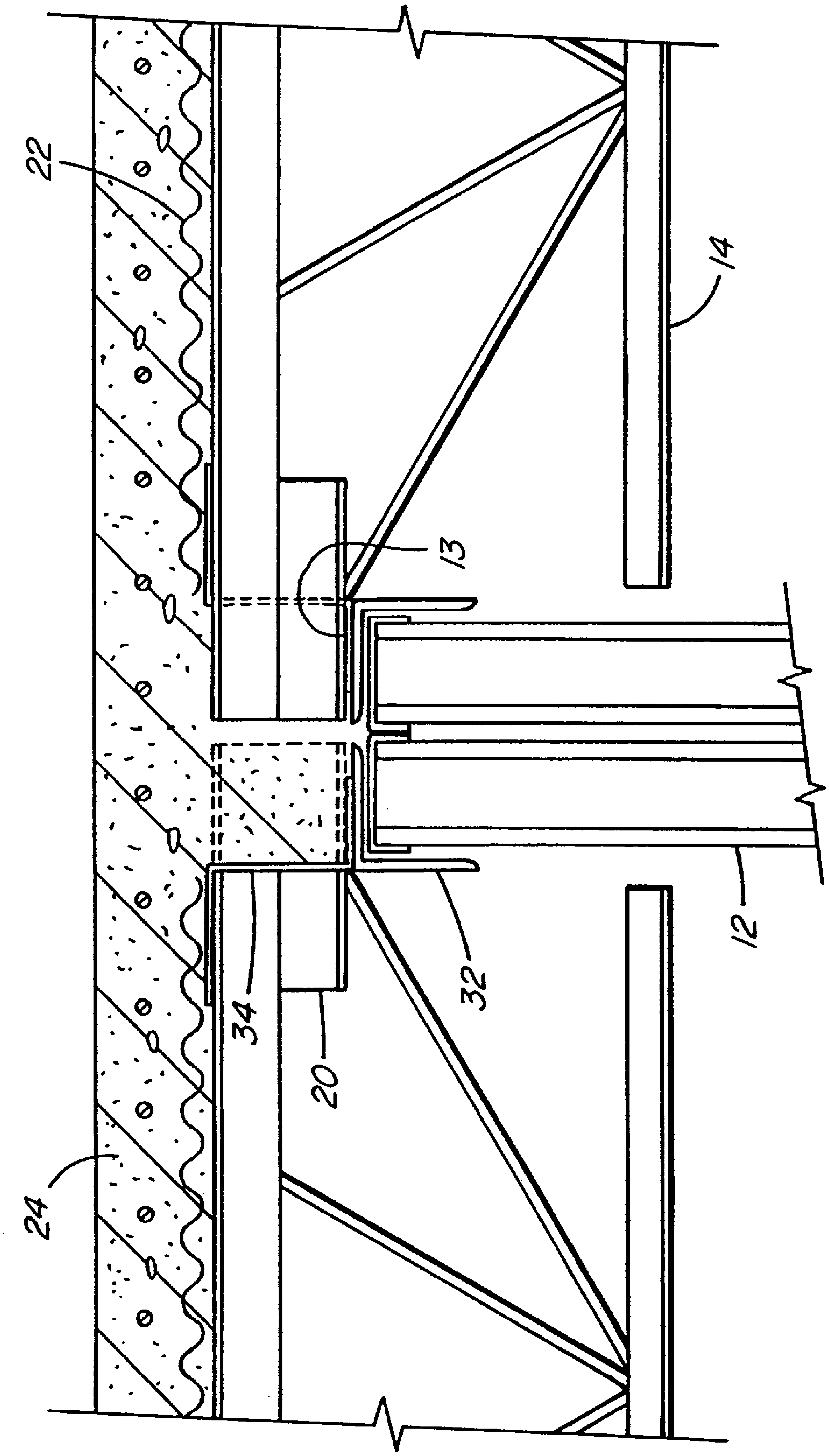


FIG. 10

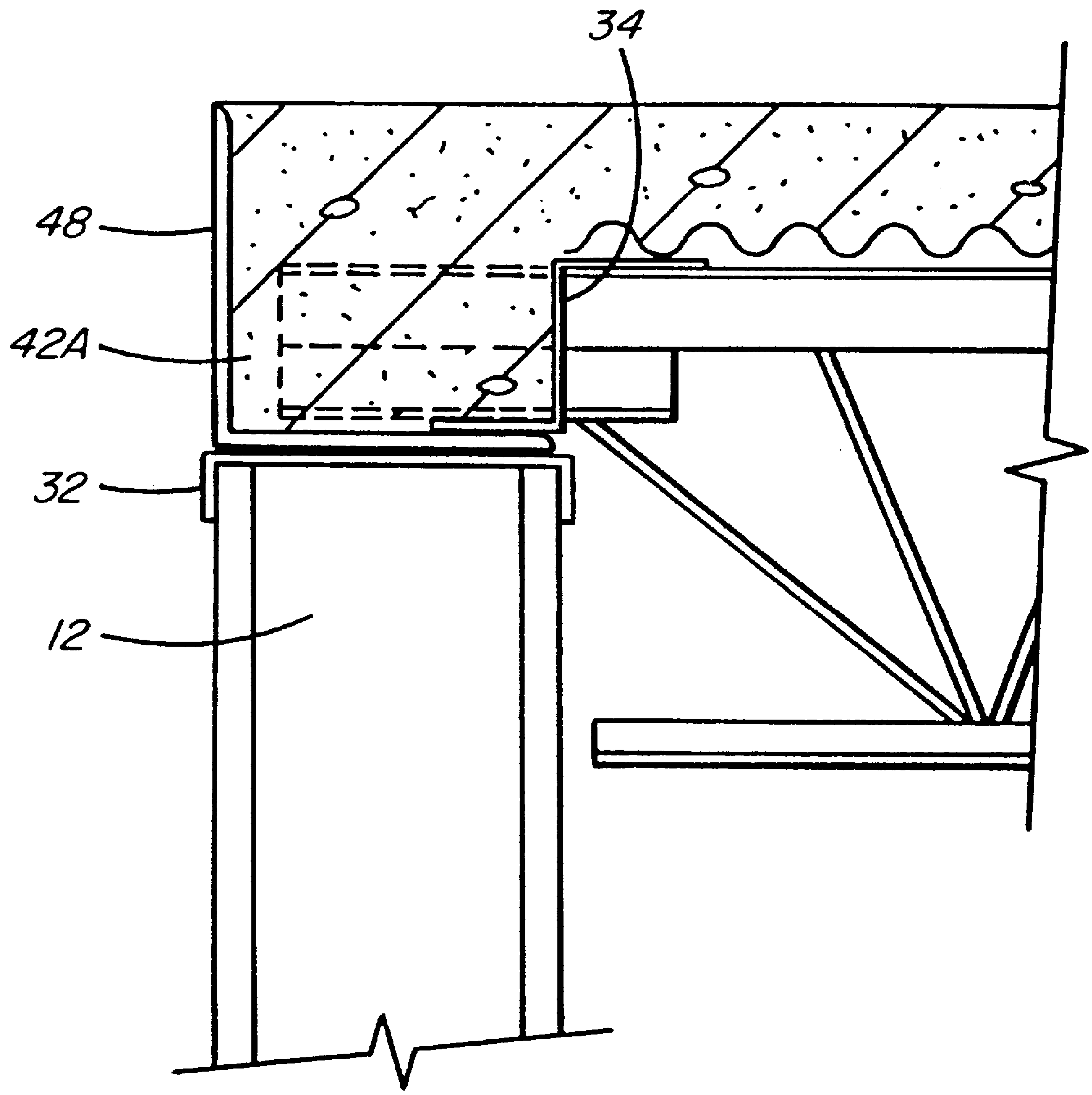


FIG. 11

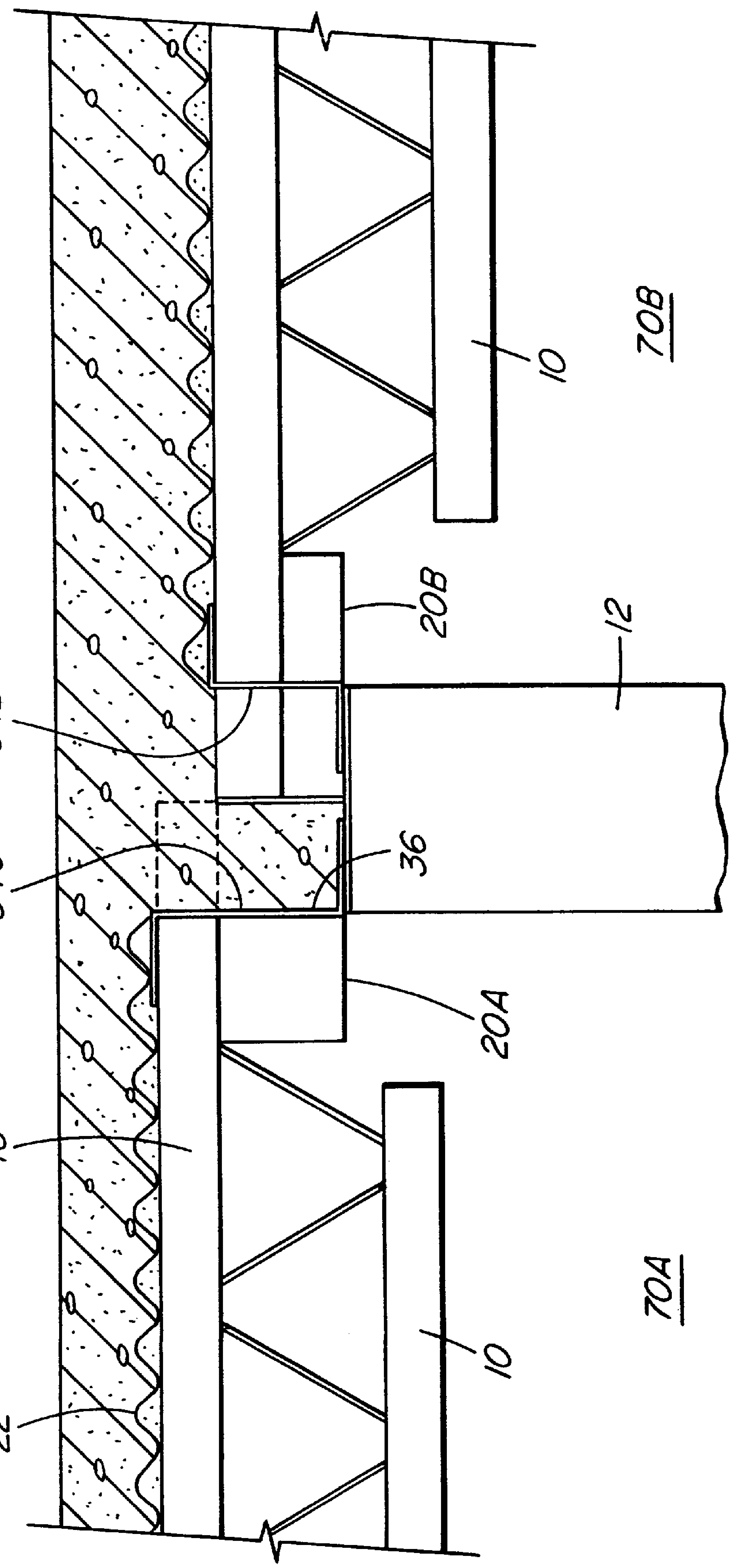


FIG. 12

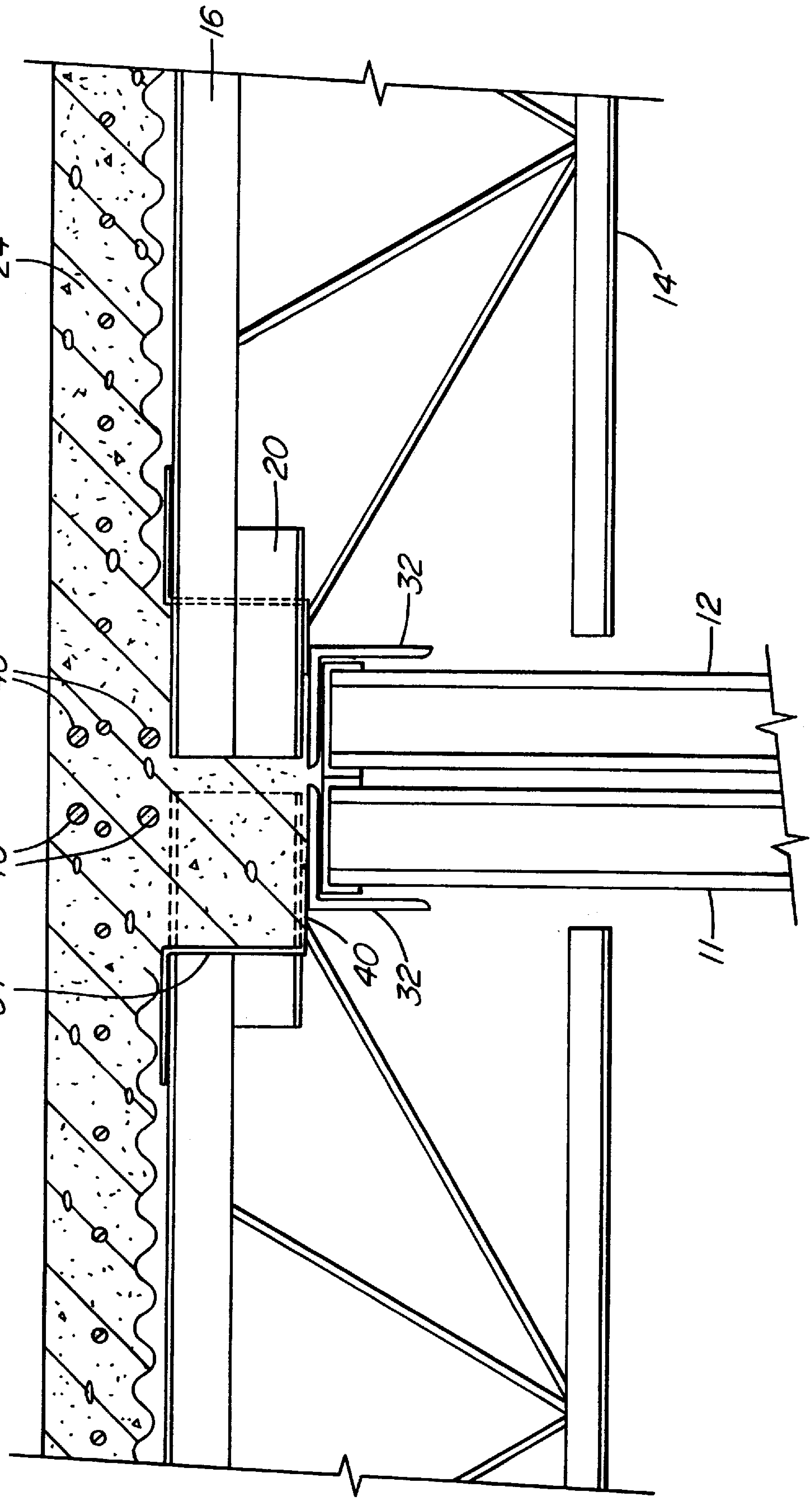


FIG. 13

STEEL JOIST AND CONCRETE FLOOR SYSTEM

TECHNICAL FIELD

This invention relates to concrete floor systems and to methods for constructing concrete floors. More particularly, the invention relates to concrete floor systems incorporating low profile open web steel joists.

BACKGROUND

Larger scale multi-story buildings are typically constructed primarily of steel and concrete. Floors in such buildings are typically constructed by spanning steel joists between structural walls and laying a metal pan or decking across the tops of such joists. The decking forms a flat surface onto which concrete is poured. Generally, the bottoms of the joists form the framework from which ceilings are hung.

Although such flooring systems are common, there are a number of difficulties associated with them. First, such systems generally allow only for floors of a uniform thickness. This in and of itself is a problem, especially when dealing with adjacent suites having different ceiling heights. Furthermore, a great deal of time, effort and money must be expended to obtain the required sound and fire protection between adjacent suites in such buildings, and between adjacent floors or stories of the building.

In such conventional systems, large gaps or airspaces are formed between the tops of the walls on which the joists sit and the underside of the metal decking which sits on top of the "joist shoes" of the joists. These joist shoes are formed by the ends of the top chords of such joists, and angle irons welded to the undersides of this portion of the top chord. One such gap is formed between each pair of adjacent joists. Depending on the size of the joist shoes, these gaps are typically between 2 and 12 inches high, and extend along the length of the support wall. Such gaps are customarily filled with rock-wool, foaming products, fire-tape and/or double layers of gypsum board. The filling of these gaps is typically done manually from underneath the poured floor, and is accordingly labour intensive and costly. Often, this job is done poorly, leading to failed fire code inspections necessitating costly repairs. Even when done correctly, this time consuming filling of such gaps does not leave a particularly sound and fire-resistant floor and wall between suites.

There have been a number of composite concrete and steel floor systems suggested which ameliorate this gap problem somewhat. For example, in U.S. Pat. No. 4,454,695, which issued in 1984, Person discloses a composite floor system including a plurality of joists which have a top chord which allows metal decking to be placed not atop the joists, but between them. Poured concrete embeds the top chords of the joists. Similar systems are disclosed in U.S. Pat. Nos. 4,700,519 and 5,544,464.

With these systems, the gaps between the tops of the supporting walls on which the joists rest and the underside of the metal decking are reduced, although not eliminated. However, such systems have associated with them other difficulties which render them inadequate for use in some situations. For example, because the metal pans used in such systems do not rest on top of the joists themselves, but rather between the joists on angle irons which form the top chords of the joists, sections of metal pan must be carefully cut to identical lengths in installing such systems. This is time consuming. Furthermore, it is often necessary to move one or more joists by a few inches to accommodate between-floor services such as plumbing. When one joist is moved, two metal pans of different lengths must be custom-cut. This leads to wastage of material.

These prior art composite floors have one first her significant disadvantage in that they transmit vibrations exceedingly well. The steel joists, being embedded within concrete along their entire lengths, form part of the floor itself. Thus, a vibration caused by, for example, a washing machine operating in one suite can be transmitted throughout the entire floor of the building.

To overcome this vibration problem, composite floor systems often employ more concrete than would otherwise be necessary to dampen vibration. This of course increases the weight of such floors, which may require shoring while concrete is curing. Shoring adds to the floor cost and to construction time. Excess concrete may also require that the building be built on stronger foundations. In some areas, ground or soil conditions may militate against such heavier buildings. Also, higher profile joists are required to support the heavier floors. Accordingly, fewer floors can be built in a building of a given height.

Additionally, when concrete floor slabs are kept relatively thin, the placement of plumbing and other between-floor services is less time consuming and problematic. Conventionally, in a thicker floor, hollow pipes or "cans" must be put into place when the floor is being poured to provide apertures for between-floor services such as plumbing. The placement of these cans is critical and such cans are commonly placed in the wrong location, necessitating costly and time consuming movement of between-floor services to match the incorrect placement of the cans. It is also labour intensive and costly to finish the concrete floor surface around these cans. This may results in a poor quality floor surface. Apertures may be made in a thinner floor by drilling or "coring" after the concrete is poured.

There is accordingly a need for a floor system which overcomes the problems of gaps or airspaces between adjacent suites, and which does not have the disadvantages of composite floors in which joists are embedded entirely in the concrete which forms the floor.

SUMMARY OF INVENTION

The concrete floor system disclosed herein comprises a first generally vertical load-bearing wall; a plurality of steel joists extending from the top of the wall to a second load bearing wall, each of the joists having a top chord, a bottom chord, webbing between the top and bottom chords, and joist shoes having a generally I-shaped profile formed on each end of the joists, the joist shoes resting on the wall; metal decking supported on and attached to the top of the joists; means for enclosing the volume formed between the top of the wall, the underside of the metal decking, and the joists, and a concrete slab poured onto the metal decking and into the enclosed volume. A force-distributing plate may cap the top of the wall.

The volume enclosing means may comprise a generally z-shaped closure fitted onto each of the joist shoes, each of the closures having a vertical face, an I-shaped void formed in the face intermediate the ends of the closure, the void corresponding to the profile of the joist shoes, a lower flange extending from the bottom of the closure face toward the centre of the wall, the lower flange resting on top of the distribution plate when the closure is fitted onto the joist shoe, and an upper flange extending from the top of the closure face which rests on top of the joist shoe, the closure when fitted onto the joist shoe forming a vertical wall between the distribution plate and the top of the joist shoe and between adjacent joists, thereby forming a concrete-accepting trough when fitted onto joists extending in opposite directions away from the wall.

In a preferred embodiment, the metal decking overlaps the top flanges of the closures, and the poured concrete embeds at least a portion of the joists. Adjacent of the closures may overlap longitudinally when fitted onto adjacent joists.

The faces of the closures may occupy generally the same vertical plane as one of the faces of the wall, or may occupy a vertical plane farther from the centre of the wall than the wall face. Wire mesh and reinforcing rods may be embedded into the concrete to add strength.

A method for constructing a concrete floor is also disclosed, the method comprising the steps of providing at least one load bearing wall capped with a force-distributing plate; inserting joist shoes of open web steel joists through an I-shaped void in a z-shaped closure having a face, and oppositely extending upper and lower flanges; placing plurality of the joists onto the force-distributing plate, the fitted closures thereby forming a concrete-accepting trough; applying metal decking to the tops of the joists, overlapping the upper flanges of the closures; and pouring the concrete onto the decking and into the trough. The method may further comprise the steps of allowing the concrete to cure, forming a concrete slab floor; and drilling holes in the slab floor to accommodate plumbing and electrical services.

Alternatively, the method for constructing a concrete floor may comprise the steps of providing at least one load bearing wall capped with a force distributing plate; placing plurality of open web steel joists having joist shoes onto the force-distributing plate; fitting z-shaped closures having a face, and oppositely extending upper and lower flanges onto joist shoes of the joists, thereby forming a concrete-accepting trough; applying metal decking to the tops of the joists, overlapping the upper flanges of the closures; and pouring the concrete onto the decking and into the trough.

BRIEF DESCRIPTION OF DRAWINGS

In drawings which illustrate specific embodiments of the invention, but which should not be construed as restricting the spirit or scope of the invention in any way:

FIG. **1** is a side view in cross-section of a typical prior art concrete and steel joist floor system.

FIG. **2** is a top view of the prior art floor system shown in FIG. **1**, showing a load bearing wall and joists, not showing metal decking.

FIG. **3** is a perspective view of a steel joist and concrete floor system made in accordance with one embodiment of the invention, with concrete cut away, viewed from overhead.

FIG. **4** is a perspective view of the floor system of FIG. **3**, viewed from underneath the floor.

FIG. **5** is a perspective view of the concrete closure of one embodiment of the invention.

FIG. **6** is a perspective view of a concrete closure of a further embodiment of the invention.

FIG. **7** is a perspective view of a concrete closure of a further embodiment of the invention.

FIG. **8** is a top perspective view of the closure shown in FIG. **5** fitted onto the joist shoe of a joist.

FIG. **9** is a bottom perspective view of the closure shown in FIG. **6** fitted onto the joist shoe of a joist.

FIG. **10** is a schematic side elevational view in cross-section of a floor constructed in accordance with one embodiment of the invention.

FIG. **11** is a schematic side elevational view in cross-section of a floor constructed in accordance with a further embodiment of the invention.

FIG. **12** is a schematic side elevational view in cross-section of a floor constructed in accordance with a further embodiment of the invention.

FIG. **13** is a schematic side elevational view in cross-section of a floor constructed in accordance with a further embodiment of the invention.

DESCRIPTION

In a conventional steel joist and concrete floor systems used in a large-scale building, illustrated in schematic form in FIGS. **1** and **2**, open web steel joists **10** rest on structural supports such as beams or a load-bearing wall **12**. Wall **12** may be constructed of steel studs, red-iron, brick, block, poured concrete or other such material.

Joists **10** have a bottom chord **14** and a top chord **16**, connected by a plurality of web members **18**. Top and bottom chords **16**, **14** generally comprise angle irons welded to web members **18**. Top chord **16** typically has a further pair of angle irons welded to its underside at both ends, together forming joist shoes **20** which rest upon top surface **13** of wall **12**. When in place on wall **12**, joists **10** are generally parallel. Although joists **10** extending in opposite directions from wall **12** may be longitudinally aligned, they are preferably staggered, as shown in FIG. **2**. Typically, adjacent joists are spaced apart by 120 cm centre to centre. Joist shoes **20** space top chords **16** above top surface **13** of wall **12**.

Typically, a corrugated metal pan or decking **22** (shown in FIG. **1**) rests on top of top chords **16** of joists **10**, and may be secured thereto by any suitable means such as welds or screws. Concrete **24** is then poured over top of decking **22** and, when cured, forms concrete floor **26**. Reinforcing material may be placed on decking **22** before concrete **24** is poured to reinforce floor **26**. Ceilings **28** are typically attached to the underside of bottom chord **14** of joists **10**. Plumbing, electrical wiring and the like is usually contained within the space between bottom chord **14** and top chord **16**.

As is readily apparent, gaps or airspaces **30** (FIG. **2**) are formed in such floor systems between the top surface **13** of wall **12** and the underside of metal decking **22**, between adjacent sets of joist shoes **20**. These gaps are undesirable.

In a floor system made in accordance with one embodiment of the present invention, shown in FIGS. **3** and **4**, load bearing wall **12** is capped by distribution plate **32** for distributing force along the length of wall **12**. Distribution plate **32** allows joists **10** to be staggered thus reducing sound and vibration conducted from one side of wall **12** to the other. Z-shaped closures **34** are placed atop of distribution plate **32**. Closures **34** have a generally vertical face **36**, an upper generally horizontal flange **38** extending away from wall **12**, and a lower generally horizontal flange **40** extending in the opposite direction. Closures **34** may conveniently be formed from sheet metal.

As shown in FIG. **5**, each closure **34** has a generally "I"-shaped aperture **35** corresponding to the end profile of joist shoe **20**. Closure **34** is fitted onto joist **10** and joist shoe **20** protrudes through closure **34** when resting on wall **12**, as shown best in FIG. **8**. Closures **34** are preferably long enough to overlap longitudinally when fitted onto adjacent joists **10**, as shown in FIG. **3**. Although closures **34** will generally be of equal length, they are not required to be. Where the distance between adjacent joists is longer or shorter than the usual distance (for example, when one joist has to be moved to accommodate plumbing), the length of closures **34** may be varied accordingly to ensure overlap.

A trough **42** is formed atop wall **12** when closures **34** are fitted onto joists extending in opposite directions from wall **12**.

Corrugated metal decking **22**, with corrugations preferably running perpendicularly to joists **10**, is placed atop top chords **16** of joists **10**. Metal decking **22** extends along the length of joists **10** from upper flange **38** of a closure **34** fitted to one end of joist **10**, to upper flange **38** of another closure **34** fitted to the opposite end of joist **10**. Decking **22** may be attached to upper flanges **38** of closures **34** by screws or by any other suitable means.

Concrete **24** is poured onto metal decking **22** and is allowed to fill trough **42**. Concrete **24** may be reinforced with wire mesh or reinforcing bars **46**. Those portions of joist shoes **20** which protrude into trough **42** become embedded in concrete **24**. When cured, concrete floor **26** and a beam portion **50** in trough **42** are formed. The filling of the spaces above wall **12** and below metal decking **22** with concrete obviates the need to install sound and fire proofing from below. The system does not require shoring and thus allows greater access for workmen to commence work directly after the floor has cured decreasing the time span of the construction phase. It will also be appreciated that the system can be designed to accommodate load bearing walls of virtually any practical width.

In the embodiment of the invention discussed above, closures **34** must be fitted onto joist shoes **20** before shoes **20** are placed onto top surface **13** of wall **12**. Alternatively, as shown in FIG. **6**, closures **34**A may have a fiber cut out section **35**A, which extends through lower flange **40** so that closure **34**A can be fitted onto joist shoes **20** without the need for joist shoes **20** to be lifted up from top surface **13** of wall **12**. FIG. **9** shows a closure **34**A fitted onto a joist shoe **20**.

It will be appreciated that although the above-discussed closures are preferred, other shapes of closures would also be suitable for use. For example, in a further embodiment (shown in FIG. **7**) closures **34**B do not have joist shoe engaging cutouts intermediate their ends, but rather, have half-I-shaped cutouts **37** at each end. Closures **34**B may be fitted between adjacent joists. Cutouts **37** conform closely to joists **10** at each end to form a trough capable of holding concrete.

FIG. **10** shows one embodiment of the invention schematically. As shown, there may be a plurality of distribution plates **32** extending along the top surface of wall **12**. Joist shoes **20** do not necessarily have to extend across the entire top surface **13** of wall **12**.

As shown in FIG. **11**, the present invention operates in substantially the same manner when dealing with an end wall **12** as it does when wall **12** is in the middle of a building. Here, end-wall angle iron **48** is fixed atop of distribution plate **32** on wall **12**. Angle iron **48** has a horizontal surface and a vertical surface which together with closure **34** form a trough **42**A for accepting concrete **24**.

As shown in FIG. **12**, the system of the present invention is particularly suited for situations wherein rooms, which may be, for example, living suites, on opposite sides of a structural wall **12** have different ceiling heights. In this situation, joists **10** extending from wall **12** towards the suite **70**A with higher ceilings have a deeper joist shoe **20**A and joists extending from wall **12** the opposite way into suite **70**B which has lower ceilings due to shallower joist shoes **20**B. Closure **34**C associated with the deeper joist shoe **20** has a correspondingly higher face **36** than closure **34**D associated with shallower joist shoe **20**, and a larger I-shaped cut out dimensioned to fit around joist shoe **20**A.

As seen in FIG. **4**, closure **34** may be placed on top of wall **12** so that face **36** is flush with the vertical surface **11** of wall **12**. The concrete beam portion **50** of floor **26** formed atop wall **12** in this case is typically non-structural. However, it is possible to construct a structural concrete beam portion **50** using the present system by extending the length of lower flange **40** of closure **34** so that face **36** of closure **34** extends out beyond wall surface **11**, as shown in FIG. **13**. Trough **42** widens, and with enough reinforcing elements such as reinforcing bars **46**, beam portion **50** of floor **26** can act as a structural element. Also, the depth of beam portion **50** can be altered as necessary by altering the depth of joist shoes **20**.

In constructing the floor system of the present invention, joists **10** are constructed as required. While most joists **10** will have joist shoes **20** of equal depth, some joist shoes **20** may be deeper and others shallower. Joists **10** are then placed between load beg walls **12**, with the joist shoes **20** on each end of joists **10** sitting on the top surface **13** of walls **12**. Closures **34**, such as those shown in FIG. **6**, are fitted onto joist shoes **20** with flanges **40** resting on top surface **13** of wall **12**. Metal decking **22** is placed on top of joists **10** and closures **34**, care being taken to cut decking **22** so that it does not overlap more than upper flange **38** of closure **34**. Concrete **24** is poured on top of metal decking **22** and into the trough **42** formed by opposed overlapping closures **34**. It will be appreciated that closures **34** can overlap to any practical length. For this reason, their exact length is not critical. What is important that they overlap at least to some extent. This prevents concrete from leaking out from between adjacent closures.

As will be apparent to those skilled in the art in the light of the foregoing disclosure, many alterations and modifications are possible in the practice of this invention without departing from the spirit or scope thereof. For example, while the upper flanges **38** of closures **34** shown in the accompanying drawings may rest on top of the angle irons which form top chords **16** of joists **10**, upper flange **38** may instead abut the underside of said angle irons, with no loss in effectiveness. Accordingly, the scope of the invention is to be construed in accordance with the substance defined by the following claims.

What is claimed is:

1. A concrete floor system comprising:

a. a first generally vertical load-bearing wall having a top;

b. a force-distributing plate capping said top of said wall;

c. a plurality of joists extending from said top of said wall to a second load bearing wall, each of said joists having a top chord, a bottom chord, webbing between said top and bottom chords, and joist shoes having a predetermined end profile at each end of said joists, said joist shoes resting on said force-distributing plate;

d. decking supported on and attached to the top of said joists;

e. means for enclosing a volume formed between said top of said wall, the underside of said decking, and said joists; and

f. a concrete slab poured onto said metal decking and into said enclosed volume;

wherein said volume enclosing means comprises a generally z-shaped closure fitted onto each of said joist shoes, each of said closures having a generally vertical face, an aperture in said face intermediate the ends of said closure, said aperture corresponding to said profile of said joist shoes, a lower flange extending from a bottom edge of said closure face toward the centre of said wall, said lower flange resting on top of said force-distributing plate when said closure is fitted onto said joist shoe, and an upper flange extending from a top edge of said closure face which rests on top of said joist shoe, said closure when fitted onto said joist shoe forming a vertical wall between said distribution plate and the top of said joist shoe and between adjacent joists, thereby forming a concrete-accepting trough when fitted onto joists extending in opposite directions away from said wall.

2. The concrete floor system as claimed in claim **1** wherein said joist shoe profile is I-shaped.

3. The concrete floor system as claimed in claim **2** wherein said decking overlaps said top flanges of said closures.

4. The concrete floor system as claimed in claim **3** wherein said poured concrete embeds at least a portion of said joists.

5. The concrete floor system as claimed in claim **4** wherein adjacent of said closures overlap longitudinally when fitted onto adjacent joists.

6. The concrete floor system of claim **5** wherein said face of said closures occupies generally the same vertical plane as one of the faces of said wall.

7. The concrete floor as claimed in claim **5** wherein said face of said closure occupies a vertical plane farther from the centre of said wall than said wall face.

8. The concrete floor as claimed in claim **6** further comprising wire mesh and reinforcing rods embedded into said concrete.

9. The concrete floor as claimed in claim **8** wherein joist shoes of joists extending in opposite directions from said wall are of differing depths.

10. The concrete floor as claimed in claim **9** wherein said joists made of steel and said closures are made of sheet metal.

11. A concrete floor system comprising:

a. a first generally vertical load-bearing wall having a top;

b. a plurality of joists extending from said top of said wall to a second load bearing wall, each of said joists having a top chord, a bottom chord, webbing between said top and bottom chords, and joist shoes having a predetermined end profile at each end of said joists, said joist shoes resting on said load bearing wall;

c. decking supported on and attached to the top of said joists,

d. means for enclosing a volume formed between said top of said wall, the underside of said decking, and said joists; and

e. a concrete slab poured onto said metal decking and into said enclosed volume;

wherein said wall is an outer wall, and said volume enclosing means comprises an angled member fitted to said distribution plate on one side thereof, and generally z-shaped closure fitted onto each of said joist shoes, each of said closures having a vertical face, an I-shaped void formed in said face intermediate the ends of said closure, said void corresponding to said profile of said joist shoes, a lower flange extending from the bottom of said closure face toward the centre of said wall, said lower flange resting on top of said distribution plate when said closure is fitted onto said joist shoe, and an upper flange extending from the top of said closure face which rests on top of said joist shoe, said closure when fitted onto said joist shoe forming a vertical wall between said distribution plate and the top of said joist shoe and between adjacent joists, thereby forming a concrete-accepting trough.

12. A concrete floor system comprising:

a. a first generally vertical load-bearing wall having a top;

b. a plurality of joists extending from said top of said wall to a second load bearing wall, each of said joists having a top chord, a bottom chord, webbing between said top and bottom chords, and joist shoes having a predetermined end profile at each end of said joists, said joist shoes resting on said load bearing wall;

c. decking supported on and attached to the top of said joists,

d. means for enclosing a volume formed between said top of said wall, the underside of said decking, and said joists; and

e. a concrete slab poured onto said metal decking and into said enclosed volume;

wherein said volume enclosing means comprises a generally z-shaped closure fitted onto each of said joist shoes, each of said closures having a vertical face, a half-I-shaped void formed in said face at each end of said closure, said void corresponding to a said profile of said joist shoes, a lower flange extending from the bottom of said closure face toward the centre of said wall, said lower flange resting on top of said distribution plate when said closure is fitted onto said joist shoe, and an upper flange extending from the top of said closure face which rests on top of said joist shoe, said closure when fitted onto said joist shoe forming a vertical wall between said distribution plate and the top of said joist shoe and between adjacent joists, thereby forming a concrete-accepting trough when fitted onto joists extending in opposite directions away from said wall.

13. A concrete floor system comprising:

a. a first generally vertical load-bearing wall having a top;

b. a force-distributing plate capping said top of said wall;

c. a plurality of joists extending from said top of said wall to a second load bearing wall, each of said joists having a top chord, a bottom chord, webbing between said top and bottom chords, and joist shoes having a predetermined end profile at each end of said joists, said joist shoes resting on said force-distributing plate;

d. decking supported on and attached to the top of said joists;

e. means for enclosing a volume formed between said top of said wall, the underside of said decking, and said joists; and

f. a concrete slab poured onto said metal decking and into said enclosed volume; and

g. a void formed in said lower flange, the width of said void corresponding to the width of said joist shoe.

14. A generally z-shaped closure for use in a concrete floor system, said closure having a generally vertical face, an aperture formed in said face intermediate ends of said closure, said aperture having a shape corresponding to a predetermined end profile of joist shoes of a joist, a generally horizontal lower flange extending from a bottom edge of said face, and a generally horizontal upper flange extending from a top edge of said face in an opposite direction from said lower flange.

15. A method for constructing a concrete floor, said method comprising the steps of:

a. providing at least one load bearing wall;

b. providing a plurality of open web joists to be supported by said load bearing wall, said joists having shoes for resting on said load bearing wall;

c. inserting said shoes through an I-shaped aperture in a face of a z-shaped closure, the closure having oppositely extending upper and lower flanges;

d. placing plurality of said joists onto said wall, said fitted closures thereby forming a concrete-accepting trough;

e. applying metal decking to the tops of said joists, overlapping said upper flanges of said closures; and

f. pouring said concrete into said trough and onto said decking.

16. The floor constructing method as claimed in claim **11** further comprising the steps of:

a. allowing said concrete to cure, forming a concrete slab floor; and

b. drilling holes in said slab floor to accommodate plumbing and electrical services.

17. A method for constructing a concrete floor, said method comprising the steps of:

a. providing at least one load bearing wall capped with a force-distributing plate;

b. placing plurality of open web steel joists having joist shoes onto said force-distributing plate;

c. fitting z-shaped closures having a face, and oppositely extending upper and lower flanges onto joist shoes of said joists, said closures extending between adjacent joists and thereby forming a concrete-accepting trough;

d. applying metal decking to the tops of said joists, overlapping said upper flanges of said closures; and

e. pouring said concrete onto said decking and into said trough.

* * * * *

(Also Form PTO-1050)

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO : 5,941,035

DATED : 24 August, 1999

INVENTOR(S) : John A.C. Purse

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In Column 5, line 28 of the specification, the word "fiber" is amended to read --further--.

Signed and Sealed this

Twenty-fifth Day of July, 2000

Attest:

Q. TODD DICKINSON

Attesting Officer

Director of Patents and Trademarks